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DESCRIPTIONS OF THREE NEW NORTH AMERICAN ANTS WITH CERTAIN ECOLOGICAL OBSERVATIONS ON PREVIOUSLY DESCRIBED FORMS

By WILLIAM STEEL CREIGHTON
College of the City of New York

Myrmica (Manica) parasitica sp. nov.

Worker: Length; 5 mm.

Head exclusive of the mandibles quadrate, as broad as long, the sides and occipital border feebly convex, the occipital angles broadly rounded. Anterior border of the clypeus entire, angular, the portion in front of the median lobe flat, the lateral portions at either side straight but receding toward the insertions of the mandibles. Median lobe of the clypeus strongly convex in two planes, sharply separated from the large, triangular frontal area. Mandibles large and powerful, the external border rather feebly convex except near the tip where it turns inward sharply. Masticatory margin armed with a long, sharp and rather thin terminal tooth and a much shorter and stouter subterminal tooth; the remainder of the masticatory margin bearing 12 - 15 small teeth. Frontal carinæ short, thick, bluntly pointed in front and rather widely separated. Antennal scapes short and rather thick, strongly and abruptly curved at the base; in repose the tip of the scape surpasses the occipital border by an amount less than its greatest thickness. First funicular joint longer than broad and somewhat broader than the adjacent joint, joints 2 - 6 gradually increasing in diameter and length, the four apical joints together form a distinct club whose maximum diameter is about three times that of the preceding joints. Eyes oval, moderately convex, set at the middle of the side of the head.

Thorax in profile with the promesonotum rather feebly convex, the promesonotal suture not impressed. Mesoepinotal suture prominent but with a shallow impression on the thoracic dorsum which is principally due to the elevated anterior edge of the epinotum since the posterior face of the mesonotum slopes directly to the suture without any impression. Epinotum in profile with a very feebly convex basal face which passes to the shorter declivious face through a poorly marked and very wide angle. In some specimens the angle between the two faces is virtually eliminated so that the profile of the epinotum is a single, convex, descending slope. Seen from above the promesonotum is pyriform and only a little wider than the subpentagonal epinotum. The sides of the thorax are only slightly constricted at the mesoepinotal suture.

Petiole seen in profile with a node which is very low, broadly and evenly convex above and without sharp transitions to the anterior or posterior peduncles. The ventral tooth on the anterior peduncle is very variable in character, In some specimens it is reduced to an angle, in others it has the form of a blunt, short tooth, in still others it is a very long and slender recurved spine. Dorsum of the postpetiole in profile with a long, sloping, feebly convex anterior face and a very short vertical posterior face. Ventral surface of the postpetiole in profile evenly convex. Seen from above the petiole is narrow and spindle shaped with the anterior peduncle slightly thinner than the posterior peduncle. The postpetiole has the form of a truncated cone with the sides convex. It is a little less than twice as wide as the node of the petiole.

Gaster bulky, oval.

The sculpture of this insect, particularly that of the head, shows considerable variation. In some specimens the entire head is covered with fine, longitudinal striæ. The more lateral of these curve downward under the antennal fossæ and are carried forward to the insertion of the mandible. In such specimens the head is feebly shining with a semi-matte appearance. In other specimens the striæ are almost entirely absent being represented by a few on the posterior parts of the frontal carinæ and others on the side of the head between the eye and the insertion of the mandible. In such specimens the remainder of the head is highly glabrous with numerous, small piligerous punctures. The same variability is true to a lesser extent of the thoracic sculpture. In some specimens the entire thorax is covered with fine punctures which grade into longitudinal striæ on the pleuræ. Such specimens are feebly shining. In other specimens the whole thorax is highly glabrous, entirely without sculpture except for a few feeble lines or punctures at the base of the pleuræ, The sculpture of the petiolar nodes is more constant since even in the heavily sculptured individuals, these are in large part glabrous. Abdomen smooth and shining with fairly numerous small piligerous punctures.

In color and pilosity the insect is more uniform. The head is piceous with the mandibles a somewhat more brownish black and having a wide band of sordid yellow extending along the masticatory margin. Thoracic dorsum blackish brown, the pleuræ of the pronotum clear, brownish yellow, the pleuræ of the mesonotum and epinotum a clear brown which is somewhat lighter on the declivious face of the epinotum. Petiolar nodes blackish brown. Abdomen a darker brown than the petiolar nodes but not as black as the head. The entire insect covered with rather long, slender, curved hairs which are pointed, erect and yellowish in color. These are most abundant on the head particularly on the ventral surface where they form poorly developed gular ammochætæ. Flexor surface of the femora with a row of stiff, erect bristles. Extensor surface of the femora, tibiæ, tarsi, antennal scapes and the proximal half of the funiculi covered with small, fine reclinate hairs. Clubs of the funiculi pubescent.

Host: *Myrmica* (*Manica*) *bradleyi* Wheeler.

Types in my collection and in the collection of Dr. W. M. Wheeler.

The series of workers upon which this species is based was taken on the summit of Polly Dome (elevation about 8600 feet), a small dome adjacent to Tenaya Lake on the Tioga Pass road in the upper part of Yosemite National Park, California. Because of glacial action the domes have precipitous sides planed to a high degree of smoothness. It is actually possible in certain lights to see a glaze on the surface, which resembles that of a polished terrazzo floor. Naturally, the domes themselves are not good areas for collecting since there is very little soil present and when any does occur it is usually in pockets of coarse gravel and sand not suitable for nest making. Despite such unfavorable conditions the nest containing the new species was found in one of these gravel pockets. When first discovered only five *parasitica* workers were taken since, at that time, the author had nothing with which to excavate the nest. These five workers together with a number of workers of the host, *bradleyi*, were taken back to camp alive and the relations between the two species observed. These were to every appearance perfectly normal, the *parasitica* workers taking their share of the activities and being treated as ordinary nest mates by the *bradleyi* workers. The following day the author returned to the nest site and excavated the entire gravel pocket, luckily a small one, down to bed rock. Eight more *parasitica* workers were secured but no queen of any kind was seen. I am of the opinion that she may have moved to a safer place following the initial disturbance of the nest since, due to the ease and completeness with which the gravel could be removed and sorted, it is curious that she should have been missed had she been present. The failure to find the queen is much to be regretted since her structure might have shed some light on the type of relation between the host and *parasitica*. As the matter stands at present it is impossible to state with certainty whether the new species is a slave maker or a temporary social parasite. In view of the fact that *parasitica* is smaller than *bradleyi* and has no mandibular specialization which might offset this disadvantage it seems more likely that the new species is a temporary social parasite.

Because of the close correspondence of general morphological characteristics it can scarcely be doubted that *parasitica* has been derived from *bradleyi.* It differs from *bradleyi,* however, in the following respects: the epinotum is lower and less angular, the node of the petiole is lower and more rounded, the sculpture is more feeble as even the most heavily sculptured individuals of *parasitica* never approach the heavy sculpture characteristic of *bradleyi,* the thorax and petiolar nodes are black (reddish yellow in *bradleyi*), the hairs are stouter, more uniformly erect and considerably more numerous on the ventral surface of the head.

Aphaenogaster (Attomyrma) huachucana sp. nov.

Worker: Length: 4.5-7 mm.

Head exclusive of the mandibles one and one half times as long as broad, the sides subparallel in the anterior two-thirds but narrowing sharply in the posterior third. Occipital border flat, less than half as wide as the greatest width of the head and bordered by a narrow but very distinct reflected flange. Clypeus moderately projecting, the anterior border sinuate with the median impression in some specimens broad, shallow and evenly concave, in others deeper, and more narrow with a distinct notch in the middle. Median lobe of the clypeus rather flat, ecarinate, not sharply marked off from the lateral portions and with an evenly rounded posterior border between the frontal carinæ. Frontal area only slightly depressed, shining with a prominent median carinula. Mandibles slender, the external margin straight except near the tip where it turns inward sharply and is convex. Outer third of the masticatory margin armed with three prominent teeth which decrease in length from the terminal tooth inward, the remainder of the masticatory margin irregularly serrate. The straight inner margin of the mandible meets the masticatory margin at a sharply marked angle. Eyes oval, of moderate size and rather strongly convex with their posterior borders lying slightly in front of the middle of the side of the head. Frontal carinæ prominent and subparallel, their lateral portions in the anterior half turned upwards so that from above this part of the carina appears narrow and welt-like. Antennal scapes long, slender and evenly though slightly curved outward. In repose they surpass the occipital border by one-third their length. The base of the scape is strongly spatulate. Funiculus filiform, joints 1 - 7 all of about the same length and diameter and all several times longer than broad, joints 8 - 12 somewhat broader than the preceding joints and slightly increasing in diameter apically.

Dorsum of the pronotum in profile feebly convex. Just posterior to the promesonotal suture the mesonotum is abruptly elevated. This elevated portion, which is flat on top, occupies the anterior half of the mesonotum and passes to the posterior half through a short and abruptly descending declivity. The posterior half of the mesonotum, which is also flat on top, is slightly if at all higher than the adjacent portion of the epinotum from which it is separated by a narrow U-shaped impression at the mesoepinotal suture. Epinotum in profile angular, the basal face, which is straight and slopes slightly to the rear, twice as long as the almost perpendicular declivious face. The angle between the two faces is armed at either side by a short, rather blunt tooth with a very wide base. Seen from above the pronotum is subpentagonal with the lateral portions carried back past the anterior half of the mesonotum so that the latter has the appearance of being a part of the pronotum. Just behind the pronotum the sides of the mesonotum are slightly constricted. There is no constriction of the sides at the mesoepinotal suture other than the very shallow incision formed by the suture itself. Seen from above the dorsal face of the epinotum bears a shallow longitudinal sulcus extending backwards between the teeth. This sulcus is bordered at either side by a ridge which extends forward from the base of each tooth.

Node of the petiole in profile with a straight, sharply sloping anterior face which meets the anterior peduncle at a wide but well-marked angle. Summit of the node blunt, the posterior face slightly convex and steeply descending to the very short posterior peduncle. There is no ventral tooth on the anterior peduncle but a narrow lamella runs almost its entire length. Postpetiole in profile notably larger than the node of the petiole, its dorsum consisting of a long, sloping anterior face, a rounded summit and a shorter and more declivious posterior face. The ventral face of the postpetiole is straight or feebly sinuate. Seen from above the node of the petiole is subcircular, about twice as wide as the anterior peduncle and a little more than half as wide as the pyriform postpetiole.

Gaster rather small, oval.

Mandibles moderately shining, covered with fine and somewhat irregular longitudinal striæ. Entire head, except for the frontal area and the antennal fossæ, feebly shining or dull, coarsely reticulo-rugose with the interrugal spaces finely granulose. Just above the insertion of the mandibles and on the clypeus the granulation is more feeble than elsewhere. In some specimens the median lobe of the clypeus lacks the granulation altogether. Antennal scapes finely and densely punctate. Thorax densely and rather more coarsely granulose than the head. In certain lights feeble rugæ may be seen on the thorax, especially on the epinotum where they are most prominent. None of them, however, are nearly as well developed as those on the head. Petiolar nodes finely granulose. Abdomen glabrous with exceedingly fine, piligerous punctures.

Hairs moderately numerous, rather short, coarse, golden, erect and somewhat obtuse. About equally numerous on all parts of the body. Femora with short, rather sparse, erect hairs: those on the tibiæ and tarsi more numerous, finer and suberect or appressed. Antennal scapes with numerous, very fine, appressed hairs; those on the funiculi longer, stouter and suberect except on the four terminal joints where the erect hairs are replaced by pubescence.

Color: head, thorax and petiolar nodes rich reddish brown to yellowish brown; the mandibles, legs and abdomen brownish yellow to clear yellow.

Described from a series of ninety workers taken in Ramsey Canyon, Huachuca Mountains, Arizona, at an elevation of 7000 feet.

Types in my collection and in the collection of Dr. W. M. Wheeler.

There can be little doubt that *huachucana* is closely related to *texana,* particularly to the variety *furvescens* Wheeler. Despite the fact that *furvescens* was originally described from material taken in Ramsey and Miller Canyons in the Huachuca Mountains I have no hesitancy in regarding *huachucana* as a distinct species since the structural peculiarities which it shows are reinforced by pronounced ecological differences. On the basis of structure the most obvious difference in the two species lies in the greater size of the new form (4.5-7 mm. in *huachucana,* 4-5.5 mm. in *furvescens*). In addition the head of *huachucana* is of a different shape. This is due largely to the fact that the sides in the narrowed posterior third are less convex, the occipital border narrower and the flange which borders the latter more pronounced in the new species. The antennal scapes in *huachucana* are notably longer than those of *furvescens* and are strongly spatulate at the base, a feature not present in the scape of the latter form. In the thorax of *huachucana* the anterior half of the mesonotum is more sharply set off from the adjacent portions of the thorax, particularly behind where there is a definite descending posterior face not found in the thorax of *furvescens.* The character of the epinotal spines is quite different in the two forms. In *huachucana* these are short and very broad at the base so that they are more aptly regarded as angular teeth than spines. In *furvescens* the spines, while only slightly longer than those of *huachucana,* are slender throughout and not tooth-like. Finally the sculpture of *huachucana* is uniformly heavier than that of furvescens.

The ecological differences are equally distinct. The nest from which the types of *huachucana* were secured was situated at the base of a rocky ledge above a very steep slope on the western side of the canyon. The arrangement was such that the nest was in the shade for the greater part of the day. The elevation, as has been already noted was 7000 feet. I have taken many colonies of *furvescens* both in Ramsey and Miller Canyons. These were invariably under stones in sunny situations not far removed from the stream bottom and at elevations not exceeding 6000 feet. Finally the actions of *huachucana* are quite different from those of *furvescens.* The insects are slow, one might almost say clumsy, in movement even when excited, a marked contrast to the active and energetic workers of *furvescens.*

On the last day of May 1932 one of my students, Mr. Solomon Friedland, while collecting along the top of the Palisades near Englewood, N. J. had the good fortune to secure a single female belonging to the genus Anergates. At that time I considered the insect identical with the European *atratulus* but subsequently, through the generosity of Dr. W. M. Wheeler, I have been enabled to compare it with specimens of *atratulus* collected by Dr. Wheeler in Switzerland. This comparison has revealed a surprising number of significant differences and I now feel that the insect taken by Mr. Friedland must be regarded as a new species. Mr. Friedland's discovery is of twofold interest for it not only gives us first record of Anergates in the New World but also furnishes important data on the distributional status of the host species *Tetramorium cæspitum.* This matter is discussed in detail at the end of the following description.

Anergates friedlandi sp. nov.

Female: Length: 2.2 mm. (the gaster not expanded)

Differing from the female of *atratulus* in the following characteristics:

The single mucronate point with which the mandible is armed longer and stouter; the convex masticatory border of the mandible very feebly serrate (smooth in *atratulus*). Eyes nearly circular in outline and strongly convex with rather fine facets (oval and moderately convex with coarse facets in *atratulus*). Lateral ocelli small and so placed that they are hidden when the head is viewed from directly in front by the rectangular occipital crest on which they are borne (lateral ocelli larger and distinctly visible from the front in *atratulus*). Antennal scapes slightly and evenly curved outward, gradually increasing in thickness from base to apex and in repose surpassing the occipital border by an amount equal to the greatest thickness (in *atratulus* the scapes are almost straight, thickest at a point about three-quarters of the distance to the apex and in repose surpassing the occipital border by an amount less than their greatest thickness). Seen from above the epaulet-like lateral portions of the pronotum are strongly concave, blunted behind and set off from the median portion of the pronotum by a rounded welt or ridge (in *atratulus* the lateral portions of the pronotum are only slightly concave, rather sharp behind and set off from the median portion of the pronotum by a sharp ridge). Scutum longer than in *atratulus* and with more overhang at the anterior edge. The posterior portion of the scutum is evenly depressed all the way across including the paraptera so that there is a sharp transition to the scutellum when the thorax is viewed in profile (in *atratulus* the depression of the scutum is median only, the paraptera not being depressed, so that there is a sort of a shallow trough formed on the dorsum of the thorax; however in profile the transition between the scutum and scutellum appears less abrupt because of the elevation of the paraptera above the level of the middle of the scutum). Scutellum narrower and much more convex than in *atratulus*. Epinotum seen from above with the lateral projections less prominent and more rounded than in *atratulus*. Seen from behind the broad longitudinal impression on the posterior face of the epinotum is broadly rounded above (narrower and rather pointed above in *atratulus*). Seen in profile the node of the petiole has a definite, short posterior face, a rounded and rather narrow summit and a long steeply sloping anterior face. Although both posterior anterior peduncles are short both are distinctly visible in profile and sharply set off from the node (in *atratulus* the node of the petiole is much bulkier with the dorsum broad and obtusely angular. The anterior and posterior peduncles are so short as to be virtually invisible when seen in profile). Postpetiole seen from above thinner from front to back than in *atratulus* with the anterior edge much less convex. The dorsum bears a shallow, median longitudinal sulcus (entire in *atratulus*). Abdomen with a deep median sulcus as in *atratulus*.

Sculpture very finely and evenly punctato-rugose except the very deeply notched clypeal border, the mandibles and the appendages which are shining. The sculpture is uniformly heavier than in *atratulus*, particularly on the posterior abdominal segments where it renders the surface definitely opaque (feebly shining in *atratulus*).

Color: head and thorax blackish brown, gaster a somewhat clearer brown, appendages dirty yellow. Wings hyaline, covered with numerous small hairs, the veins and stigma pale yellow.

Type in my collection.

It is much to be regretted that this interesting insect is known only from a single specimen. Following Mr. Friedland's discovery I returned with him to the type locality, a small meadow at the side of U. S. Highway No. 9 about three miles north of Englewood, N. J. In this place there are many nests of *Tetramorium cæspitum* constructed in coarse, gravelly soil along the sides of a fill over which the highway runs. Although we examined a number of the nests and although, during the following spring, the site was revisited for more extensive observation, no additional specimens have been taken. This is scarcely surprising in view of the rarity of the European *atratulus*.

As has already been mentioned the presence of Anergates in North America presents some points of peculiar interest. In the Old World *Anergates atratulus*, a workerless parasite with degenerate, pupoidal males, is known to occur only in the nests of *Tetramorium cæspitum*. There is no reason to suppose that the American species possesses a generically different host. However it has been generally held that the presence of *Tetramorium cæspitum* in this country has come about through introduction from Europe. In point of fact there is more than a little evidence in favor of such a view. In 1905 when Dr. W. M. Wheeler published a list of the ants of New Jersey (1) he outlined the range of *T. cæspitum* as follows: "It occurs northward and eastward of New York as far as the Connecticut boundary, westward as far as Philadelphia and southward as far as Virginia." In subsequent years Dr. Wheeler published two other faunal lists dealing with New England species. The first of these (2) which appeared in 1906 covered all the New England states. In this paper there is a single record of *cæspitum* based on material taken by Dimmock at Springfield, Mass. The second of the lists mentioned above (3) appeared in 1916 and dealt with Connecticut only. In this paper Dr. Wheeler stated that *cæspitum* must certainly occur in Connecticut but he added that at the time of publication he had no actual records of the insect from that state. In 1927 Dr. Wheeler, reported (4) the first appearance of *cæspitum* in metropolitan Boston, In the same year I found several colonies of this ant along the paths of the Arnold Arboretum in Forest Hills. I have subsequently received specimens from Dr. Geo. Tullock taken at Bridgewater, Mass. Since *cæspitum* is by no means an obscure ant it follows that the virtual absence of New England records prior to 1929 can scarcely be credited to oversight on the part of collectors. For this reason its appearance in the vicinity of Boston in 1928 may be regarded as a migrational ingress. This is entirely in keeping with the character of an introduced species but is not easy to explain in the case of a native form.

All of the above evidence is, of course, negated by the discovery of an American species of Anergates. Under these circumstances to continue the belief that *Tetramorium cæspitum* is an introduced ant necessitates the assumption, that when introduced a nest of *cæspitum* contained specimens of Anergates and since the time of introduction Anergates has undergone sufficient change to rank as a separate species. The author finds neither point tenable and is therefore prepared to regard *cæspitum* as a native member of our North American ant fauna. This bears out evidence presented by two of Emery's earlier records for *cæspitum,* one from Tennessee, the other from Nebraska. These records were always troublesome to the older view of *cæspitum* as an introduced species since both lie well beyond the eastern range of the ant and are separated from it by areas in which *cæspitum* apparently does not occur. Such a distribution need occasion no remark in the case of a native form.

One additional point may be considered here. It is possible that the insect which we now regard as the North American representative of *Tetramorium cæspitum* may not be cospecific with the European form. As far as the author can ascertain there are no differences of specific significance but since *cæspitum* shows a number of variants in Europe it is difficult to make a positive statement in this regard. However, even should the North American *Tetramorium* prove identical with one of the European forms of *cæspitum* its status as a native ant remains unaltered. One need only cite the case of *Formica fusca* to furnish an example of a holarctic host which supports specifically different parasites in the Old and New Worlds and whose distribution cannot possibly be the result of introduction.

ECOLOGICAL NOTES.

(1) An unusual slave of *Formica sanguinea* subsp. *puberula* Emery.

During the summer of 1933 the writer had the opportunity of collecting in the La Sal Mountains in southeastern Utah, an excellent region of unusual scenic beauty. The area worked was in the vicinity of the Warner Ranger Station which is situated on the northwestern side of Mount Allen at an elevation of about 9500 feet. Most of the collecting was done at the upper edge of a sage brush area which covers a large part of the top of Wilson Mesa. At the elevation just mentioned the sage brush is stunted in size and occurs on exposed ridges between which there are valleys filled with aspen trees. In this aspen-sage brush association one of the most abundant ants is *Formica sanguinea* subsp. *puberula* Emery. Of the many colonies of this insect which the author examined one was unique in containing specimens of *Formica microgyna* subsp. *rasilis* Wheeler as slaves. In addition a second slave, *Formica cinerea* var. *altipetens* Wheeler, was present. This second slave need cause no comment since other forms of *cinerea* have been previously reported as enslaved by *puberula*. So far as I am able to determine, however, there is no previous record of the enslavement of any member of the *microgyna* group.

It may be seen that there are two explanations for the formation of the colony just described. The simplest assumption is that the *rasilis* workers had been brought into the nest as a result of dulosis. On the other hand, since *rasilis* is known to be a temporary social parasite, it is possible, though not likely, that the colony might have arisen through the simultaneous entry of a female of *puberula* and one of *rasilis* into the original *altipetens* colony. A thorough excavation of the colony lead to the finding of two females of *puberula* but no female of *rasilis* was seen. In this case I feel that it is permissible to utilize the negative evidence resulting from her absence and state that the *rasilis* workers had been secured through dulosis since, less than a hundred yards from the excavated nest, I subsequently found a *puberula* colony engaged in attacking a nest of the typical *microgyna*. The *microgyna* nest was built at the base of a small sage brush plant around the stem and lower branches of which the rather flat mound had been constructed. On the surface of the mound were numerous clusters of ants. Examination showed that these consisted of two or three *microgyna* workers industriously engaged in dragging away a worker of *puberula*. In no case did I see any dead raiders. Nevertheless the activities of the *microgyna* workers were effective if not lethal for, when their nest was opened, not a single raider was found inside.

Several interesting deductions may be drawn from the above data. In the first place it seems obvious that the *rasilis* workers present in the original *puberula* colony were obtained as the result of some unusual condition which enabled the raiders to enter a nest from which they would have ordinarily been excluded. In the second place we may safely conclude that the infrequent occurrence of members of the *microgyna* group in the nests of slavemakers is due to the defensive activities of the former and not to any discrimination on the part of the slave makers. This is entirely in keeping with the idea advanced by Dr. W. M. Wheeler (5) that the type of slaves which appear in the nests of dulotic species will be determined by the abundance and degree of docility of the enslaved species.

(2) The nest founding of *Formica ulkei* Emery.

While collecting in the Black Hills of South Dakota in September 1933 the author secured numerous specimens of *F. ulkei* Emery in the type locality, Hill City. Among these was a single female which had been adopted by a small colony of *Formica fusca*. It may be recalled that in his monograph of the genus Formica Dr. Wheeler postulated *fusca* as the temporary host of *ulkei* (6). The nest in which the female just mentioned was taken was a small one consisting of not more than three dozen *fusca* workers most of which were minims. It seems likely, therefore, that the nest-founding activities of *ulkei* differ in no essential respects from those of *exsectoides*, the female securing adoption by a depauperate queenless colony of the host species. It may be added that in the neighborhood of Hill City the nests of *ulkei* are widely separated with little evidence for the formation of daughter colonies through migration. Further south, however, in the Custer State Park the author found areas in which there were several nests in close proximity. Although these multiple nest colonies are perhaps less numerous than the enormous groups formed by the eastern *exsectoides* there is ample evidence that *ulkei* does on occasion form daughter colonies by migration.

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MOSQUITO INVESTIGATIONS IN ALASKA

By George S. Tulloch
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During the summer of 1931 the United States Department of Agriculture and the United States Smelting Refining and Mining Company entered into a coöperative agreement in connection with investigations as to the "habits, biology and methods of control of mosquitoes in Alaska". The writer was employed by the United States Smelting Refining and Mining Company to carry on the investigations under the technical direction of F. C. Bishopp of the Bureau of Entomology. The investigations were carried on in the vicinity of Fairbanks, Alaska, with headquarters at the Fairbanks Exploration Company, a subsidiary of the United States Smelting Refining and Mining Company. Laboratory quarters (Fig. 1) were located at Fox, eleven miles northeast of Fairbanks.

The purpose of the investigations was to determine if practical control methods could be suggested which would reduce the annoyance of mosquitoes to men engaged in gold mining operations. In this region workmen must protect themselves from the attacks of these pests. Nets (Fig. 2) and gloves or similar means of protection (Fig. 3) serve this purpose during the periods in which mosquitoes are abundant. Although mosquito investigations have been carried on in many parts of the world, it is believed that this was the first attempt to study the control of mosquitoes in a practically arctic environment.

The area in which the investigations were carried on lies between 64°-10' and 64°-50' north latitude and between 147°-20' and 147°-20' and 147°-50' west longitude in the Yukon-tanana region which forms a part of the central plateau of Alaska. Mr. James Crawford, research engineer of the

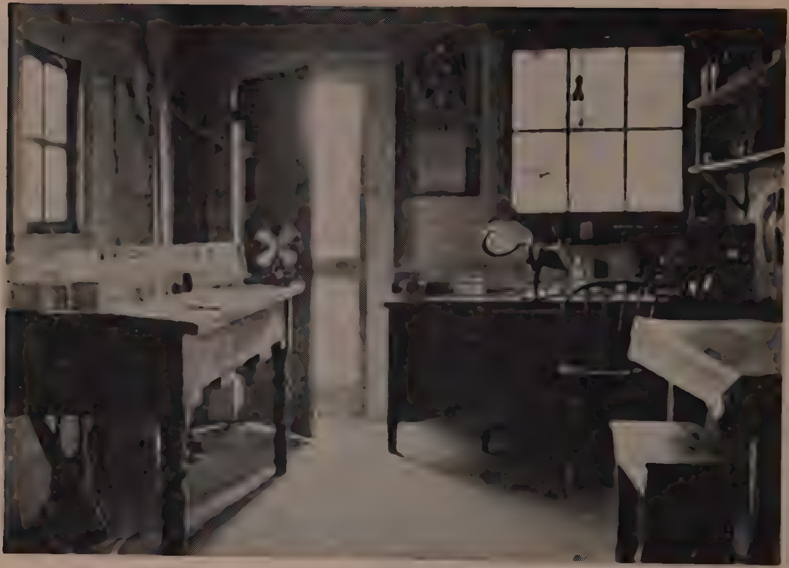

Fig. 1. Laboratory Quarters at Fox, Alaska

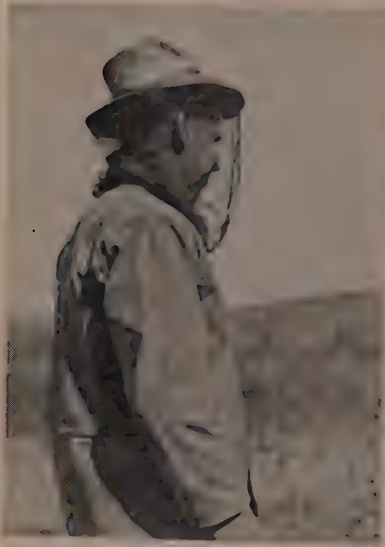

Fig. 2. Net used as protection against mosquitoes

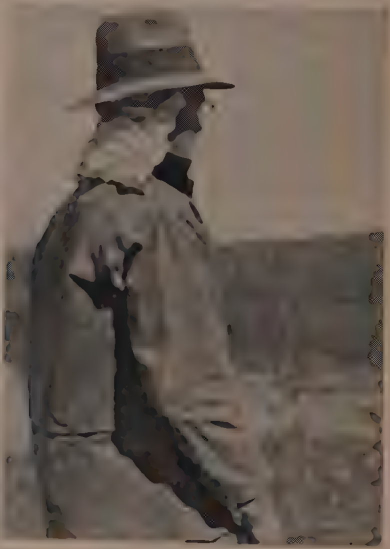

Fig. 3. Use of gloves as protection against mosquitoes

Fairbanks Exploration Company, has described the general region as follows:

"The region may be described as a plateau, with bed rock composed predominantly of schists, which has been cut by numerous streams and their tributaries. Comparatively broad unsymmetrical valleys with broad interstream areas are characteristic. Isolated prominences, locally known as domes, which are composed of igneous rocks and owe their presence to the resistance of such rocks to weathering, rise above the general level of the neighboring ridges (Fig. 4). The average elevation of the ridges is around 2000 feet above sea level, while that of the valleys varies from 470 feet at Fairbanks to 940 feet in the valley of Goldstream at Gilmore."

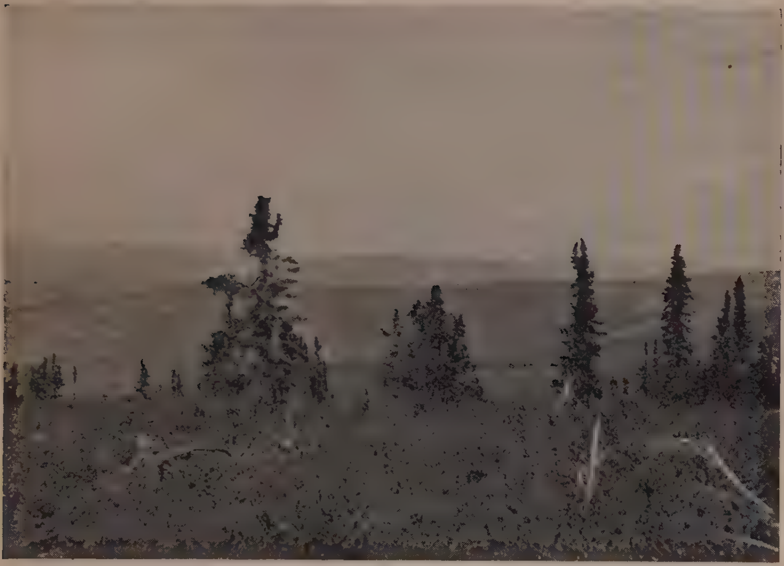

Fig 4. Characteristic view of country in the region where mosquito investigations were made

"The region has been subjected to long continued and intricate stream modeling and since it lies outside the area of glaciation, its topography is due almost exclusively to stream erosion. A mantle of 'muck', in part decomposed organic material, covers the hillsides and the unconsoligated gravel deposits in the valleys. This mantle is in turn covered by varying thicknesses of moss on the hillside, which is combined with bunch grass, locally known as 'niggerheads' in the valleys. Spruce trees grow extensively on the side hill while clumps of birches, willows and alders are found in the valleys. Since the ground is permanently frozen over large areas and during the summer thaws to shallow depths only, the trees are for the most part stunted."

"The drainage in the area is controlled by the Tanana, the chief streams being the Chatanika, Goldstream, and the Tanana. Most of the tributaries head at about the same elevation, have about the same grade and carry approximately the same amount of water. The courses of the small tributary streams are well defined and definite throughout their lengths, however, drainage conditions in the flat portion of the valleys traversed are poor, due in part to frozen ground and vegetation. In most of the valleys shallow swamps interspersed with 'niggerheads' stand above the general elevation of the stream. In the broad valleys such as those of the Chatanika and Goldstream, large areas of such swamps are present. * * * *."

The climate of the interior of Alaska is characterized by extremes in temperature and light precipitation. The so-called "interior" of Alaska is the drainage system of the Yukon River with its tributaries, the Koyukuk, Chandalar, Tanana, Kantishna and Porcupine Rivers. This region lies well to the north of the Gulf of Alaska and the Aleutian chain of islands. It is well known that the vicinity of The Alaska Peninsula is a continuous low pressure area and a breeding place for storms. The cyclones and anti-cyclones occurring in this region move eastward across the Gulf and follow several established routes across the United States and Southern Canada. The offshoots from these lows rarely affect the climate of the interior, although they cause storms and precipitation on the southern slopes of the Alaska Range. Occasionally a low pressure area will move through the interior, coming up from the Bering Sea. These give southerly winds throughout the interior. During the summer the heated interior of Alaska is conducive to low pressure areas of slight intensity which, in turn, induce precipitation.

The precipitation over the greater part of the interior is small. Around Fairbanks it averages from 10 to 14 inches. About 25% of this occurs in the form of snow. Normally the wettest months are July and August with June and September following. These four receive over half the year's precipitation. Over a period of 15 years the records show that the wettest years gave over twice the precipitation of the dry years. This disparity is due largely to the excess of rainfall in the summer months of the wet years and a deficiency of rainfall in dry years rather than marked changes from normal in other months. Around Fairbanks snow is usually gone by the last of April, although an occasional fall of snow in May or June is not uncommon. During the summer months rainfall is sometimes attended by mild thunderstorms and sometimes hail.

The summers of interior Alaska have delightful temperature conditions. They are warm enough for comfort, but are not oppressively hot. The long days and continuous sunshine cause rapid growth of vegetation. The highest temperature ever recorded over many years was 100° F. at Fort Yukon in July, 1915. The spring months have the highest percentage of possible sunshine and the late fall and the early winter months the least. Fairbanks averages 17 clear days in April and only 8 in September. Winter temperatures are as low as 75° F.

The situations in which mosquito larvæ were found developing fall into two fairly well defined categories. The first included those areas in which the water was present during the greater part of the summer while the second included those areas in which the pools were temporary in nature. Prospect shafts and permanent swampy areas are included in the first category while the surface pools found in the moss and in the "niggerheads" are included in the second category.

The larvæ found to be peculiar to the permanent breeding areas represented two species, *Culiseta alaskæensis* and *Culex apicalis.* The larvæ of the first species appeared during the latter part of the season having developed from eggs laid by the overwintering females. The larvæ of the second species were found earlier in the season, having developed from overwintering eggs. The adults of *C. alaskæensis* although they were present in great numbers during the early part of the season of 1931 did not cause any great annoyance to the workmen.

The following species appear to be represented in the material collected during 1931:

TABLE I

1.	*Anopheles maculipennis* Meigen	Adult
2.	*Culiseta alaskæensis* Ludlow	Larva and Adult
3.	*Culiseta impatiens* Walker	Adult
4.	*Aëdes diantæus* H. D. and K.	Larva
5.	*Aëdes communis* Felt and Young	Larva and Adult
6.	*Aëdes fitchii* H. D. and K.	Larva
7.	*Aëdes punctor* Kirby	Larva and Adult
8.	*Aëdes aldrichi* Dyar	Larva and Adult
9.	*Aëdes cyclocerculus* Dyar	Larva
10.	*Aëdes leuconotips* Dyar	Larva
11.	*Aëdes impiger* Walker	Larva
12.	*Aëdes aboriginis* Dyar	Larva and Adult
13.	*Aëdes stimulans* Walker	Larva and Adult
14.	*Aëdes cataphylla* Dyar	Adult
15.	*Culex apicalis* Adams	Larva and Adult
16.	*Eucorethra underwoodii* Underwood	Larva and Adult
17.	*Chaoborus trivittatus* Loew	Larva
18.	*Corethra* sp.	Larva and Adult

The mosquitoes found to be developing in the temporary situations represented several species, many of which were troublesome. The water in these pools resulted from two sources, the more important of these being the melting of the snow. The subsequent accumulation of water in small pools provided excellent breeding places for the development of the larvæ from the overwintering eggs. The second source was not of as much consequence, being the result of the thawing of the frozen ground; the water rising to the surface and forming new pools or adding to the pools which had resulted from the melting of the snow. During some seasons it is possible that the rainfall during April and May may result in the formation of pools similar to those formed by the melting snow. Such a condition did not exist during 1931; water from rainfall acted in a contributory capacity, viz., replenished pools so that the water remained long enough to allow larvæ to complete their normal development.

Although the number of species present was rather large only four, *A. punctor, A. communis, A. aldrichi* and *A. stimulans* were present in large numbers. As far as is known, the life histories of these four species are very similar, the general description which follows being equally applicable to all. The eggs are laid in summer on moist or dry ground and remain unhatched until after having been exposed to winter cold. Early in the spring when rising temperatures cause the accumulated snow and ice to melt forming pools on the frozen ground, the eggs hatch and the first stage larvæ appear. During 1931 some larvæ reached maturity early in June, pupation being first noted on June 8. Adults of *A. communis, A. punctor,* and *A. aldrichi* appeared about the same time in the middle of June and were present in noticeable numbers throughout the same period (Table 2) during the season. *A stimulans* appeared somewhat later and was present in numbers throughout a longer period than the other three. Information pertaining to the distribution and relative abundance of these troublesome species was collected by the timekeepers at four different stations in the gold dredging area. The method employed was to have each timekeeper make a five minute collection at the same time and the same place each day. Specimens were sent in for identification on Saturday of each week. The results from one of these collection points are tabulated below. These results are similar to others collected from other stations except in a few minor details.

TABLE II

Number of specimens of different species taken in five minute collections on man at Gilmore, Alaska.

Date	No. of specimens	Aedes communis	Aedes punctor	Aedes aldrichi	Aedes stimulans	Culiseta alaskaensis	Anopheles maculipennis	Unidentified*
6-17	20	4		6		1	1	8
6-18	11	7						4
6-19	16	5		1				10
6-20	3				1	2		
6-21	30	3	7		1			19
6-22	3							3
6-23	20					2		18
6-24	20	2						18
6-27	8		1					7
6-28	15	1			1	1		12
6-29	6				2			4
6-30	2				1			1
7-2	4				3			1
7-3	4			1	3			
7-6	8				5			3
7-7	7				5			2
7-8	4							4
7-16	3				3			
7-18	3				2			1
8-11	4				4			
8-12	2				2			
8-13	5				5			
8-14	4				4			
8-15	5				5			
8-16	4				4			
8-17	6				5			1

*Specimens damaged during collection.

Although no detailed study of the various natural factors controlling the abundance of mosquitoes was made, the following observations were made which indicated that considerable numbers of mosquitoes were destroyed by predacious insects and other enemies. Larvæ of Dytiscid and Hydrophilid beetles were abundant as well as backswimmers, all of which are known to be efficient enemies of mosquito larvæ. The predacious larvæ of three species of mosquitoes (Table 1) were found in large numbers and birds and amphibians reputed to prey upon the larva or adult mosquito were present also in this region.

It was a generally admitted fact that the mining operations themselves have aided in abating the nuisance from mosquitoes. The removal of the surface moss and muck and the dredging operations have reduced the extent of the breeding areas. The removal of brush has reduced the extent of the natural environment preferred by the troublesome adults and driven them away from the vicinity of the workmen. As a result of these two operations the conditions in certain localized areas have been improved greatly. At the conclusion of the investigation in 1931 specific recommendations were made relative to further improving the conditions near the mining operations.

As indicated before the major portion of the breeding during 1931 was in the pools in the moss and the niggerheads situated in the lower level portions of the valleys, These pools are usually covered partly or entirely with dead grass and moss from the previous year. The presence of this dead vegetation retards the evaporation of water as well as impedes the drainage. It was recommended that all the dead grass and moss around the operations be removed by burning during the spring of the year. This recommendation was prompted by the observation that an area of about one hundred acres which had been fired accidentally contained relatively few pools containing larvæ while in the adjacent unburned areas larvæ were abundant in the pools. Other recommendations included oiling and draining of pools within 500 yards of the operations, the use of copper sulphate as a larvicide and the use of repellants by the workmen. Control work was carried on during 1932 under the direction of Mr. J. D. Crawford. In the report at the end of the season, Mr. Crawford recommended that the work be continued during the season of 1933.

TWO NEW NORTH AMERICAN ANTS

By M. R. Smith
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Recently I received for identification from Illinois, two species of ants which I believe to be new to science. One of these, a *Leptothorax,* was collected by Miss Mary Talbot at Plainsfield. To this species, which is characterized by its peculiar type of sculpturing, I have assigned the name *foveata.* The other new ant is a member of the *Lasius Acanthomyops* group. Workers of this species were collected at Herrin, by Drs. T. H. Frison and H. H. Ross. Although this ant has many characters that will set it apart from its cogeners, I have chosen the name *parvula* for it because of its unusually small size.

Dr. W. M. Wheeler confirms my opinion that both of these species are new.

Leptothorax foveata sp. nov.

Worker:—Length 2.43 mm.

Head moderately large, excluding the mandibles, noticeably longer than broad, with moderately convex sides, rounded posterior angles, and straight posterior border. Eyes large and prominent, oval, convex, placed near the middle of the sides of the head. Mandibles with 5 distinct teeth. Clypeus convex, with anterior border entire. Antennæ 11-segmented; scape lacking its greatest width or slightly more of attaining the posterior border of the head; first funicular segment longer than segments 1 and 2 taken together. Thorax short, robust, convex above; viewed dorsally the humeri are rounded, the pro-mesonotal suture very faintly visible, and the meso-epinotal suture only slightly more perceptible. Epinotal spines moderately long and robust, directed upward, outward and backward. Petiole viewed in lateral profile with feebly concave anterior surface, faintly convex or flattened superior surface, which posteriorly rapidly descends toward the postpetiole. Postpetiole from above with convex node, which is very distinctly broader than long.

Head, thorax, petiole, and postpetiole, with foveate impressions, subopaque; those on the head much finer, especially on the front and vertex where they are intermingled with very fine longitudinal rugulæ; remainder of head, and dorsum of thorax, petiole, and postpetiole reticulate-foveate. Gaster glabrous, appendages very similar.

Head, thorax, petiole, postpetiole, and gaster sparsely covered with short, erect, clavate hairs of a grayish or light yellowish color. Pubescence very fine and appressed, extremely sparse, most easily discernible on appendages.

Color deep reddish brown or ferruginous brown, with lighter appendages and gaster. Eyes and mandibular teeth black.

Described from a single worker, the type of which is in my collection.

The type worker, and an abnormal worker specimen were collected by Miss Mary Talbot in the nest of *Aphænogaster fulva* subsp. *aquia* Buckley in a roadside ditch at Plainfield, Illinois on May 25, 1933.

This species is so different from all of the *Leptothorax* with which I am familiar that I am somewhat hesitant in trying to assign it to its proper taxonomical position. In Wheeler's key to the species of *Leptothorax* (Proc. Acad. Nat. Sci. Phila. p. 223, (1903) the specimen would apparently key down to the *acervorum canadensis* group. From *canadensis* the species can be distinguished by the following characters: (1) lack of a distinct longitudinal impression on the clypeus, (2) longer scape, (3) shorter thorax, (4) poorly developed pro-mesonotal and meso-epinotal sutures, and (5) differently shaped petiole and postpetiole.

The most striking characteristics to me are the unusually prominent eyes of the worker, as well as the peculiar type of sculpturing; the species has, therefore, been very aptly named *foveata*.

Lasius (Acanthomyops) parvula sp. nov.

Worker:—Length 3.0 mm.

Head, excluding the mandibles, only very slightly longer than broad, narrower in front than behind, and with straight or very feebly excavated posterior border and regularly convex sides. Mandibles, each with 6 to 7 very distinct teeth and some smaller, less defined denticulæ; the superior surface without teeth as with *L. interjectus*. Eyes extremely small, resembling somewhat those of *L. flavus* subsp. *nearcticus*, apparently with not more than 6 ommatidia in their greatest diameter. Antennal scapes short, scarcely if at all, exceeding the posterior border of the head. Petiole apparently lower and thicker than with *L. interjectus;* anterior surface convex, posterior surface flattened, and superior surface transverse, entire.

Body, and coxæ and femora of legs covered with rather abundant, moderately long, erect, pale yellowish hairs. Pubescence fine and appressed, sparsely covering all parts of body except the appendages.

Pale yellowish, especially the gaster, which is lighter than the other parts of the body.

Described from 4 workers, the cotypes of which are in my collection.

These ants were collected by Drs. T. H. Frison and H. H. Ross of the Illinois State Natural History Survey at Herrin, Illinois, on October 12, 1933. According to these gentlemen the ants were collected in the soil beneath a rotten log in an open wood lot. They were associated with *Lasius niger* var.

That this species belongs to the subgenus *Acanthomyops* is clearly indicated by the 3-segmented maxillary palpi of the workers. At a glance one would assign the species to *L. flavus nearcticus* because of the pale color, small eyes and general size of the workers. I believe this to be a perfectly valid species as evidenced by the following characters: (1) the extremely small size of the worker, (2) unusually small eyes, (3) very short antennal scapes, (4) lack of teeth on the superior surface of the mandibles, and (5) pale yellow color. This is apparently the smallest North American *Acanthomyops* that has yet been described.

THE EUROPEAN CORN BORER ON LONG ISLAND[1]

By S. M. Dohanian

Bureau of Entomology, U. S. Department of Agriculture

The land area of that part of New York State known as Long Island and composed of Kings, Queens, Nassau, and Suffolk counties, is 30 percent greater than that of the State of Rhode Island. Of the 878,720 acres of land on Long Island 126,108 acres were under cultivation in 1929 according to the latest available agricultural census. Long Island is about 120 miles long, its greatest breadth being 20 miles. An irregular range of low hills extends most of the length of the Island a little north of the center; south of this range the surface is comparatively level, while to its north hills and valleys predominate. The average elevation of the land along the north side is about 100 feet, there being only 4 or 5 hills with an altitude greater than 300 feet.

Outside of a considerable residential portion practically all of Nassau County, a large part of the townships adjacent to it on the east, and the entire eastern half of Suffolk County (where the soil permits) are under intensive cultivation. The chief products are potatoes, corn, cauliflower, lima beans, and various truck crops. The 1930 census figures show that 40,350 acres were planted to potatoes, 6,257 acres to field corn, and 4,957 acres to sweet corn.

The first infestation on Long Island by the European corn borer (*Pyrausta nubilalis* Hübner) was discovered in Kings County (Brooklyn) in August 1923.[2] The larvæ found proved to be of the one-generation strain. In 1927 four townships (Southold, Shelter Island, Southampton, and East Hampton) at the extreme eastern end of the Island were found to be infested with the two-generation strain of the borer. The Bureau of Entomology, by establishing a field laboratory on the Island, took immediate advantage of the opportunity thus presented of studying the two strains of this pest simultaneously in the presence of extensive corn acreages and in a situation more or less typical of a large area along the Atlantic seaboard. The principal objective of this project, which was carried on in cooperation with the Bureau of Plant Quarantine, was to ascertain the sources of residual overwintering borer population that would form the nucleus of the reinfestation in the following spring.[3] Incidentally much information of a varied character was obtained which has led to a better understanding of the insect.

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[1] "The Long Island Project," conceived by D. J. Caffrey, was started in 1927 by R. A. Vickery. R. E. Kimport continued the work from 1928-1930 under the direct supervision of Mr. Caffrey, in 1931 under B. E. Hodgson, and in 1932 and 1933 under A. M. Vance. Acknowledgement for helpful criticism in the preparation of this paper is due A. M. Vance, and D. W. Jones.

[2] During the period 1923-1928, unsuccessful efforts were made both by State and Federal agricultural authorities to eradicate the corn borer infestation in this and contiguous areas.

The easterly dispersion of the one-generation strain of the borer from the site of the original colony at the extreme western tip of the Island has been slow indeed. During the decade of its existence there the borer has invaded an average of only 4 miles of new territory each year. This seems a comparatively slow spread when the nature of the terrain, the general direction of the prevailing winds, and the abundance of corn are considered as factors exceptionally favorable for dispersion. Among the probable factors restraining a more rapid spread may be mentioned (1) the efforts at eradication practiced in this area from 1923 to 1928, inclusive, by the Bureau of Entomology in cooperation with the State of New York; (2) the absence of field corn on that end of the Island, which limits hibernating quarters for the borers; (3) the fact that the one-generation borer rarely attacks weeds, which also limits hibernating quarters; and (4) the fact that in this district, where considerable early sweet corn is grown for metropolitan New York markets, many of the cornfields are plowed under as soon as the ears have been harvested (while the stalks are still green and the corn borer larvæ within are in the immature feeding stages) preparatory to the planting of fall crops.

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[3] The results of this investigation have been summarized in an unpublished manuscript by R. E. Kimport.

On the other hand, the westward spread of the two-generation strain of the borer from the eastern end of the Island has been more than twice as rapid. In 1927, Mattituck, on the north fork, and Southampton, on the south fork, formed the western limits of the two-generation infestation, while in the late summer of 1933 evidences of this strain were encountered as far west as Greenvale in Nassau County, a distance of about 60 miles. Consequently, there exists (1933) an overlapping of the two strains in an area of approximately 275 square miles a little west of the center of Long Island. In the townships of Oyster Bay in Nassau County and Babylon, Islip, Huntington, and Smithtown in Suffolk County evidences of both the one-generation and the two-generation strains have been found.

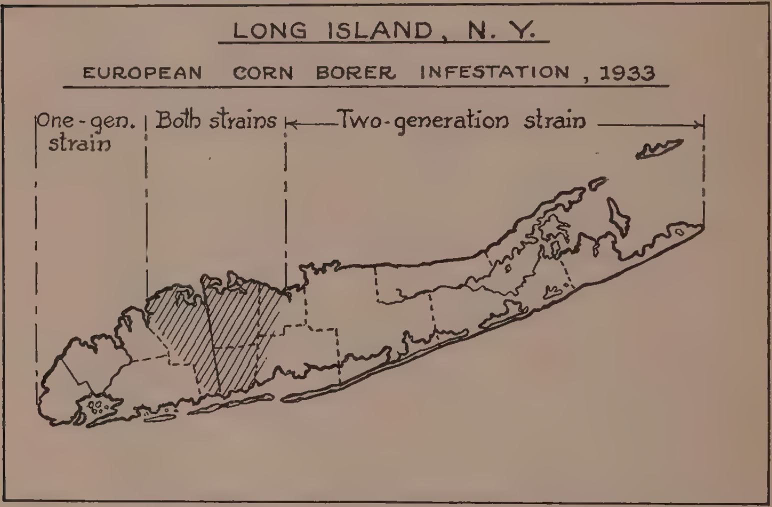

Fig. 1. Map showing distribution of both broods of the European Corn Borer on Long Island

Since 1928 annual "infestation surveys" have been made to determine the intensity of European corn borer infestations in corn in both the single-brood and the double-brood districts of Long Island. In the former the surveys were conducted in midsummer, while in the latter they were made in the early fall after the second generation larvæ had become established in corn. There appears to have been a slow but steady increase in the borer population of the one-generation district from 1928 to 1933. The average number of borers per 100 plants was 1.2 in 1928, 2.4 in 1929, 3.4 in 1930, 13.4 in 1931, 5.5 in 1932, and 8.6 in 1933.

In the two-generation district the average number of borers per 100 plants was 128.5 in 1928, 50.9 in 1929, 65.7 in 1930, 401.9 in 1931, 394.4 in 1932, and 356.5 in 1933. It may be seen that previous to 1931 the infestation in Suffolk County was not heavy. The decided increase in numbers that occurred that year in the eastern half of the county, which has since been maintained, made it the most severely infested district in the entire area occupied by the two-generation strain of the European corn borer for the years 1931 and 1932. To illustrate the severity of infestation a cornfield may suffer, an actual case in Southold Township, on the north fork, may be cited. In 1931 this field showed a 100 percent plant infestation. The dissection of 10 infested plants, selected in accordance with a uniform method of sampling, gave an average of 57 borers per plant. The borer population of the field was therefore 5,700 borers per 100 plants. Seventy-four borers was the maximum number found in a single plant in this field. Undoubtedly a number of factors are responsible for the continued heavy infestation in the eastern half of Suffolk County. Not the least among these may be the enormous carry-over in potato plants of the first-generation borers, which afterward infest corn. Thousands of acres of both corn and potatoes are interspersed throughout the eastern half of Suffolk County.

The larvæ of the European corn borer have been found infesting 23 kinds of plants on Long Island, among which are vegetables, flowers, and weeds. A systematic survey of the Island would probably enlarge the following list of host plants compiled by R. E. Kimport.

Zea mays L. (corn).
Holcus sorghum L. (Sudan grass).
Echinochloa crusgalli (L.) Beauv. (barnyard grass).
Chaetochloa sp. (foxtail).

Iridaceae (iris family): Gladiolus hybrids (gladiolus).
Rumex sp. (dock).
Polygonum hydropiper L. (common smartweed).
Rheum rhaponticum L. (rhubarb).
Chenopodium album L. (lamb's-quarters).
Beta vulgaris crassa Alef. (beet).
Spinacia oleracea L. (spinach).
Amaranthus retroflexus L. (pigweed).
Phaseolus vulgaris L. (kidney bean).
Phaseolus lunatus macrocarpus Benth. (lima bean).
Solanum tuberosum L. (potato).
Solanum melongena L. (eggplant).
Lycopersicon esculentum Mill. (tomato).
Cucumis sativus L. (cucumber).
Cucumis melo L. (muskmelon).
Cucurbita pepo L. (pumpkin).)
Ambrosia elatior L. (ragweed).
Dahlia pinnata Cav. (dahlia).
Arctium sp. (burdock).

According to B. E. Hodgson[4] eight of these plants are "true hosts," serving the dual purpose of food and hibernation. To date corn is the only plant known to suffer real commercial damage. Two other major crops of the area, however, although their yield is probably not seriously lowered by the European corn borer, are considered extremely important hosts. The first of these is the potato. This plant is attacked rather severely at times by the first-generation borer. For example, in 1933, in Suffolk County, potato plants harbored 51 first-generation borers per square rod to 99 borers in each square rod of corn. The liking which the European corn borer appears to have for the potato plant is of considerable significance in view of the fact that this plant serves as a convenient and very important carry-over host, thus furnishing moths of the first generation to attack corn and some of the late vegetable crops. Where corn and potatoes are planted in close proximity, danger of serious commercial damage to corn, and possibly also to potatoes, is greatly enhanced.

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[4] Hodgson, B. E. The host plants of the European corn borer in New England. U. S. Dept. Agr., Tech. Bull. 77, 63 pp., illus. 1928.

The other important host plant is the lima bean. Although there is but little loss in yield from the attacks of the European corn borer on lima beans, this plant becomes a potential means of spread for the insect into noninfested areas, when its pods are transported into such territory.

The development of a severe infestaton in the two-generation district on the eastern tip of the Island, and its practical isolation from neighboring infestations, presented an excellent opportunity to demonstrate the extent and efficacy of control by parasites. Accordingly, during the summer of 1933 a total of 67,435 imported parasites of the European corn borer were liberated at carefully selected points in the eastern half of Suffolk County. In these liberations were represented 13 European and 3 oriental species, as shown in the following list:

Species	*Number of Individuals*
Apanteles thompsoni Lyle	126
Campoplex multicinctus (Grav.)	35
Campoplex pyraustae Smith	12
Ceromasia lepida Meig. (oriental)	278
Chelonus annulipes Wesm.	1,630
Cremastus flavoorbitalis (Cam.) (oriental)	233
Eulimneria alkae Ell. & Sacht.	696
Eulophus viridulus Thoms.	21,017
Inareolata punctoria (Roman)	3,686
Lydella stabulans var. *grisescens* R.D.	19,524
Macrocentrus gifuensis Ashm.	17,139
Microgaster tibialis Nees	2,804
Phaeogenes nigridens Wesm.	20
Phorocera erecta Coq. (oriental)	4
Zenillia mitis Meig.	99
Zenillia roseanæ B. & B.	132
Total liberated	67,435

Judged by their past ability to adapt and acclimatize themselves, and by the effective work they have done since their introduction into both the New England and the North Central State areas, it seems very probable that the two parasites *Inareolata punctoria* and *Lydella grisescens* will be the first to become established and to prove beneficial on Long Island. In addition to the numbers of these two species liberated in 1933, as shown above, 1,229 individuals of *I. punctoria* and 5,916 of *L. grisescens* were colonized in the township of Southold, in the north fork, during the summer of 1932. Except for these two species, no parasites of the European corn borer, however, had ever been liberated on Long Island previous to 1933. A parasite census here four or five years hence should supply interesting results and useful information.

When the European corn borer invaded Long Island it seemed to have found ideal conditions in which to live and to thrive. Favorable weather conditions combined with the abundance of corn on the Island furnished an environment strongly in its favor. The absence of its natural parasites and diseases also aided its rapid increase. Paradoxical though it may seem, the farmers themselves unwittingly assisted its increase by failing to destroy the materials in which the borers hibernate. (New York State has not enacted the "compulsory corn borer clean-up" law in force in some of the New England States). The history of the European corn borer on Long Island has been such as to make the invasion by this insect an important economic problem not only for Long Island but also for other areas along the Atlantic seaboard where conditions are similar, and some of these are already infested.

AN ANNOTATED LIST OF THE ANTS OF THE SNAKE RIVER PLAINS, IDAHO (HYMENOPTERA:FORMICIDAE)

By A. C. Cole, Jr.
Twin Falls, Idaho

The ants of the Snake River Plains region, while comprising relatively few forms in comparison with other areas, are, however abundant in so far as the number of colonies is concerned. Floristically, the region is divided into (1) the vast semidesert plains of sagebrush, rabbitbrush, greasewood, shadscale and bromegrass; (2) the tall perennial grass upland habitats, in which grow the Agropyrons and Stipas and subalpine meadow vegetation; and (3) the mountainous and hilly areas, chiefly inhabited by western yellow pine, with juniper and alder at slightly lower elevations.

1. *Pogonomyrmex occidentalis* Cresson[1]

This is the dominant and most abundant ant of the semidesert areas. It usually builds pebble mounds with cleared surrounding area. Winged forms appear from late June to late July. Food consists of seeds of many plants although chiefly those of *Bromus tectorum* L. (Downy Bromegrass) when present. Crater nests of *Dorymyrmex pyramicus* are occasionally on the mound faces and in the denuded areas.

2. *Pheidole californica* Mayr.

This ant is abundant in sagebrush areas of the Snake River Canyon but decreases in number with northward progression, being only occasional in the tall grass meadows. It nests beneath rocks, usually on hillslopes. Colonies are rather populous. Soldiers are present, in proportion to workers about one to ten. Food consists chiefly of small seeds and some insects. Winged forms appear in August.

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[1] Determinations and checkings by Dr. M. R. Smith.

3. *Pheidole oregonica* Emery

P. oregonica occupies the same habitats as does *P. californica,* but its colonies are usually less populous.

4. *Leptothorax curvispinosus rugatulus* Emery

This ant is rather frequent in moist habitats near Twin Falls, Hagerman and Buhl, chiefly along the Snake River. Colonies are small, the workers timid and sluggish and the brood scant. Winged forms appear at Twin Falls in late September.

5. *Leptothorax eldoradensis* Wheeler

The species *eldoradensis* occurs in small numbers near Twin Falls, where it occupies small crater nests in moist areas.

6. *Monomorium minimum* Buckley

Occurring in small numbers, this species occupies either minute crater-nests or nests beneath fallen timber and loose rocks. The populous colonies often contain several queens each. Winged forms appear in the nests from the middle of June to late August.

7. *Monomorium pharaonis* L.

One colony of this species was found under a house near Twin Falls. This locality is decidedly out of its normal range.

8. *Solenopsis molesta* Say

This ant is occasionally found beneath rocks in moist habitats throughout southern Idaho, and is usually observed in the superficial nest chambers of other ants (*Formica fusca subsericea* and *F. fusca neorufibarbis* Emery).

9. *S. molesta validiuscula* Emery

Much more abundant than the typical species, colonies of this variety are widely scattered throughout the region under discussion, but make their appearance only in moist areas. The nests are similar to those of the typical *molesta* but are more isolated and of smaller size.

10. *Manica mutica* Emery

One colony of this ant was observed beneath a large rock along a stream, thirty-five miles south of Twin Falls. It was quite small and the occupants, all workers, were sluggish and unoffensive.

11. *Myrmica brevinodis* Emery

Three nests of this species, which is rather abundant in the Middle West, were beneath rocks in a very moist *Agropyron repens* area near Twin Falls.

12. *M. brevinodis sulcinodoides* Emery

Several colonies of this variety were beneath rocks in *Hordeum jubatum* areas along streams at Twin Falls. The workers were abundant and very sluggish. Winged forms appeared in the nests during early July.

13. *Aphaenogaster uinta* Wheeler

Six large colonies of *uinta* nested beneath rocks in the moist Snake River Canyon, near Twin Falls. Only the workers were found, all of whch were very timid.

14. *A. subterranea occidentalis* Emery

This variety is rather commonly distributed in moist areas, where it builds small nests beneath rocks. Winged forms apear in July and August, depending upon the locality.

15. *Stenamma brevicorne* var.

This undetermined variety of *brevicorne* is of lesser importance in the Twin Falls area, where it occupies very minute nests near streams or in other moist habitats.

16. *Crematogaster lineolata* var. (near *cerasi* Fitch)

Large colonies of this ant abounded beneath flat rocks throughout the semidesert area, being more numerous, however, in rather moist places. Each colony contained many queens. Winged forms appeared in late June near Twin Falls.

17. *Dorymyrmex pyramicus* Roger

Nests of this species were found in limited numbers near

Twin Falls, occupying small, flat crater-nests of fine sand, in open areas of the sagebrush semidesert, and occasionally on the faces and in the denuded areas of mounds of *Pogonomyrmex occidentalis* Cresson.

18. *Tapinoma sessile* Say

Large colonies of this very common and well known ant are beneath rocks in moist places. Winged sexes appear in late June at Twin Falls.

19. *Iridomyrmex pruinosus* var.

Populous colonies of very active workers of an undescribed variety of *pruinosus* were found near Hagerman, inhabiting aggregated crater nests of fine sand in an area of greasewood.

20. *Lasius niger americanus* Emery

This very common occupant of the more moist areas throughout the state, nests beneath fallen timber or rocks, and more rarely occupies small, rude crater-nests of earth or sand. The workers are abundant and much brood develops into winged forms throughout June, July and August, depending upon the location of the nests. The ants are secretivorous and in some cases also scavengeristic.

21. *L. niger sitkaënsis* Pergande

Although less common than the variety, *americanus, sitkaënsis* is, nevertheless, a rather frequent occupant of moist places. Its nests and habitats are almost identical with those of *americanus.*

22. *L. umbratus mixtus aphidicola* Walsh

This variety lives beneath stones in very moist areas throughout the Snake River Plains. Its food consists chiefly of secretions from aphids and coccids which are attended in the nests.

23. *Polyergus rufescens breviceps* Emery

Only one nest of this species, which contained many workers of *Formica fusca subsericea*[1], was observed by the writer.

[1] Slave complex.

It was beneath a large flat rock on a dry sagebrush-covered hillslope in the Snake River Canyon, near Twin Falls.

24. *Myrmecocystus melliger semirufus* var.

Numerous crater nests, about six inches in diameter, predominated in a semidesert sand dune area near Indian Cove, and have also been found on sand hills near Buhl. The populous colonies contained both males and females in early June at Indian Cove. Repletes were not present.

25. *M. yuma* Whlr.

Many small crater nests of fine sand were found on a sagebrush plain near Hammett. The workers were very active. Winged forms appear in the nests during early July. Repletes were not found.

26. *M. mexicanus* var.

Sandy crater nests of an undescribed variety of *mexicanus* abounded in a sandy area near Indian Cove. Other localities include Hollister and Twin Falls. Males and females appeared in the nests in early June near Indian Cove and in late June near Twin Falls. True repletes were not present in the nests.

27. *Camponotus maculatus vicinus nitidiventris* Emery

This variety abounds beneath rocks in the more moist places of the sagebrush plains and in wooded areas of aspen and western yellow pine at higher elevations. The colonies are large and the workers active. Males and females appear in the nests throughout June and July near Twin Falls. I have taken this ant as far north as Boise.

28. *C. hyatti* Emery

A very few colonies of this species were beneath rocks on rather moist sagebrush and bromegrass-covered hillslopes near Twin Falls.

29. *C. modoc* Whlr.

This species is abundant in pine and aspen groves south of Rogerson. It inhabits nests in moist, rotting logs.

30. *Formica rufa obscuripes* Forel

This ant is a very common occupant of the Snake River Plains, where, as populous colonies, it inhabits large thatched mounds, usually surrounding plants of sagebrush. It has been taken by the writer as far north as Stanley, where it is replaced by the variety *melanotica* Emery. Winged sexes appear during late June near Twin Falls.

31. *F. subpolita* Mayr.

Common to the semidesert plains and occurring throughout the state, this species is found inhabiting nests beneath rocks, and less commonly small crater mounds. Winged forms appear in early July at Twin Falls. Coccids and pseudoscorpions have been removed from nest chambers.

32. *F. subpolita camponoticeps* Whlr.

This variety is of less common occurrence than is the typical species but, nevertheless, very often nests beneath rocks under similar conditions and in the same localities as the typical *subpolita*. Workers were infested with the fungus *Laboulbenia formicarum* Thaxter.

33. *F. fusca neorufibarbis* Emery

F. neorufibarbis lives beneath rocks or in earthen mounds in rather moist, shady and grassy areas throughout the Snake River plains. It feeds chiefly on honeydew and dead insects.

34. *F. fusca subsericea* Say

This very common ant is found in practically all parts of the region where it inhabits nests beneath rocks or occupies large earthen mounds.

35. *F. fusca subaenescens* Emery

F. subænescens is more rare than is *subsericea* and occupies more moist habitats. Where found, the nests are beneath large rocks. The an thas been collected near Twin Falls and Stanley.

36. *F. neogagates* Emery

A few nests of this species have been found by the writer in a deep canyon near Twin Falls. These were rather small and were beneath rocks on moist hillslopes covered with bunchgrass (*Agropyron* sp.).

37. *F. sanguinea subnuda* Emery

Nests of *subnuda* were found, although rather infrequently, from the southern border of the state northward to Boise. The small colonies, in which abounded workers of *F. fusca subsericea* as slaves, were beneath large rocks in moist sagebrush areas.

38. *F. sanguinea puberula* Emery

Several small colonies of this ant were observed near Nampa, on the sagebrush plains. Many of the adults were infected with the fungus, *Laboulbenia formicarum* Thaxter.

39. *F. oreas comptula* Wheeler

Three nests of this rather uncommon ant were found by the writer near Rogerson, beneath large flat rocks on a sagebrush-covered hillslope. Winged forms appeared in early July. Each of the nests contained two or three beautiful golden-yellow queens.

40. *F. lasioides vetula* Whlr.

Several colonies of this ant were found at the upper limits of the Snake River Plains. The ants live beneath rocks in moist areas of abundant vegetation.

A SPECIES OF EPISTENIA (HYMENOPTERA, CHALCIDOIDEA) FROM COLORADO

By T. D. A. Cockerell
University of Colorado, Boulder, Colo.

On April 5, 1934, Mr. Charles H. Hicks bred a very beautiful Chalcidoid from the nest of an Odynerid wasp, found a short distance above the mouth of Boulder Canyon, Boulder County, Colorado. Trying to determine its affinities, I thought it might be referable to the genus *Ormyrodes* of Brues, said to be recognisable by "the extremely long, awl-shaped abdomen, uniformly punctuate body, hairy eyes, and long postmarginal vein in wings." The hind coxæ, also are considerably enlarged. However, there were discordant characters: the shorter abdomen, not at all constricted at end of third segment, and first tergite smooth, as well as the well developed parapsidal grooves. The specimen was transmitted to the Museum of Comparative Zoology, and Professor C. T. Brues kindly examined it and at once referred it to the genus *Epistenia* of Westwood, of the Cleonymidæ. This is a widespread genus of rather numerous species, but apparently they are nowhere common, as I do not remember ever having captured a specimen. The resemblance to the Ormyridæ is presumably entirely superficial. Up to the present time 24 species of *Epistenia* have been described, distributed as follows: Georgia (1), California (1), Guatemala (1), Panama (2), Brazil (5), Paraguay (4), Peru (1), Chile (2), South Africa (1), Philippines (1), Borneo (2), Queensland (3). The Colorado species has the following characters:

Epistenia regalis sp. n.

Female: Length about 8 mm.; anterior wing nearly 5; elongate, coarsely punctured, head, thorax, abdomen and coxæ rich purple, legs otherwise clear red, with very fine pruinose white pubescence; antennæ long, with a stout black flagellum, pointed at apex, its basal joint blue; the long scape, shining greenish blue on outer side, is inserted very little above the mouth; head and thorax dull, with very dense coarse punctures, making a cancellate surface; profile of thorax above practically straight; prothorax very large, swollen, parapsidal grooves very distinct, the mesonotum accordingly trilobed; a black curved keel bounding axillary region anteriorly; scutellum very large and convex, with no groove, the apex nipple-like; base of metathorax shining; tegulæ small and black; wings hyaline with black veins; marginal vein less than half length of submarginal; stigmal long and distinct, thickened at end; postmarginal at least as long as marginal; front femora robust, with a tooth beneath toward end; hind femora moderately stout; the large hind coxæ rough with fine dense punctures, running in rows; abdomen nearly 5 mm. long, long-fusiform; the short first tergite smooth, shining green and rosy; second to fourth deep purple, with black hind margins, the surface covered with very large round punctures, not in rows, the dorsum not keeled; apical part of abdomen black and keeled, the ovipositor little exserted. The eyes have very long hairs.

Type in Museum of Comparative Zoology, Cambridge, Mass.

It may be that all the species of *Epistenia* are parasitic on Eumenidæ. *E. odyneri* Ashmead (Psyche, VII, 1896, p. 336) was bred by Dr. A. Davidson in California from *Odynerus rufobasilaris* Ashmead. It is quite a different species, the female 6 mm. long, strongly green, flagellum rufopiceous beneath, knees honey-yellow, tibiæ and tarsi dark fuscous.

SOME ANTS FROM THE BAHAMA ISLANDS

By William Morton Wheeler
Biological Laboratories, Harvard University

Our knowledge of insect distribution in the Bahamas is very meager, limited as it is to a very few of the nearly seven hundred islands and cays composing the archipelago. Of the ants, a group of greater importance in zoögeographical discussion than many other families or even orders less intimately dependent on the soil, I have records from only three of the islands. The account of these insects which I published nearly 30 years ago[1] was based on material which I collected on New Providence and Andros. Mann, 1920, in addition to recording and describing several new forms from the same localities, cited seven species collected by Bluff on Eleuthera Island[2]. I was glad, therefore, to receive from Dr. David Fairchild and Mr. James Greenway a collection of ants which they made on New Providence Island and on some thirteen of the other islands while they were collecting plants, birds and mammals on two expeditions, during 1932 and 1933, of Mr. Allison Armour's yacht, the "Utowana." Both gentlemen accompanied the first expedition, but owing to Dr. Fairchild's illness, Mr. Greenway alone collected ants on the second. The collection comprises 22 forms, and though there are no new forms it furnishes two new records (*Iridomyrmex pruinosus* and *Camponotus planatus*) for the archipelago.

Ponerinæ

Odontomachus hæmatoda insularis Guérin var. *pallens* Wheeler-Wemyss Bight and Bannermantown, S. Eleuthera I. ☿ (Greenway).

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[1] Wheeler, W. M. The Ants of the Bahamas, with a List of the Known West Indian Species. Bull. Amer. Mus. Nat. Hist. 21, 1905, pp. 79-135, 1 pl., 12 figs.

[2] Mann, W. M. Additions to the Ant Fauna of the West Indies and Central America. Bull. Amer. Mus. Nat. Hist. 42, 1920, pp. 403-439, 10 figs.

Pseudomyrminæ

Pseudomyrma flavidula F. Smith—One worker from Watlings I. (Greenway).

Pseudomyrma elongata Mayr—One worker from Conception I. (Greenway).

Myrmicinæ

Pheidole megacephala Fabr.—Grand Bahama I. ♃ ☿ ♀ and Watlings I. ♃ ☿ (Greenway).

Pheidole fallax jelskii Mayr var. *antillensis* Forel—New Providence I. ♃ ☿ and Watlings I. ☿ (Greenway).

Pheidole flavens Roger—Bannermantown, S. Eleuthera I. (Greenway).

Crematogaster (*Orthocrema*) *steinheili* Forel—Bannermantown, S. Eleuthera I. ☿ (Greenway); Mayaguana I. ☿ ♀, nesting in pods of mahogany (Fairchild).

Crematogaster (*Acrocoelia*) *lucayana* Wheeler—Grand Bahama I. ☿ (Greenway).

This form is probably only a variety of *C. sanguinea* Roger of Cuba.

Monomorium carbonarium ebeninum Forel—Watlings I. ☿ ♀, New Providence I. ☿ and Bannermantown, S. Eleuthera I. ☿ ♀ (Greenway).

Solenopsis geminata Fabr.—Great Inagua I. ☿, Watlings I. ☿, New Providence I. ☿, Crooked I. ☿ and Clarence Harbor, Long I. ☿ (Greenway); Conception I. ☿ (Fairchild and Greenway). The typical black West Indian form of the species.

Cyphomyrmex rimosus minutus Mayr—Crooked I. ☿ (Greenway).

Dolichoderinæ

Iridomyrmex pruinosus Roger—Mayaguana I. ☿ (Greenway). Common in Cuba and Florida but not previously recorded from the Bahamas.

Dorymyrmex pyramicus Roger—Nassau, New Providence I. ☿, Crooked I. ☿ and Cat I. ☿ (Greenway).

These workers are intermediate in color between the typical form of the species and the following variety.

Dorymyrmex pyramicus var. *niger* Pergande—Goat Cays ☿, Crooked I. ☿, East Plana Cay ☿ and Conception I. ☿ (Fairchild); Watlings I. ☿, Mayaguana I. ☿ and Rum Cay ☿ (Greenway).

Formicinæ

Brachymyrmex heeri Forel—Two workers from Cat I. ☿ (Greenway).

Brachymyrmex heeri var. *obscurior* Forel—Rum Cay ☿ ♀ ♂ (Fairchild and Greenway); New Providence I. ☿, Watlings I. ☿, Great Inagua I. ☿ and Crooked I. ☿ (Greenway).

Camponotus (*Tanæmyrmex*) *conspicuus æqualis* Roger—Nassau, New Providence I. ☿ (Greenway).

Camponotus (*Tanæmyrmex*) *fumidus lucayanus* Wheeler—Nassau, New Providence I. ☿ and Bannermantown, S. Eleuthera I. ☿ (Greenway).

Camponotus (*Tanæmyrmex*) *ramulorum* Wheeler var. *marcidus* Wheeler—East Plana Cay ☿, living in dead stems of Cocothrinax (Greenway).

Camponotus (*Colobopsis*) *triton* Wheeler—I have recently described this species (Bull. Mus. Comp. Zool. 77, 1934) from a single female specimen taken by Dr. W. M. Mann at Fresh Creek, Andros I.

Camponotus (*Myrmobrachys*) *planatus* Roger—A single small worker from Grand Bahama I. (Greenway).

Not previously recorded from the Bahamas though common in Cuba and Southern Florida.

Paratrechina longicornis Latr.—New Providence I. ☿, Great Inagua I. ☿, Abaco I. ☿, Rum Cay ☿, Crooked I. ☿ ♀, Watlings I. ♀ ♀ and Bannermantown, S. Eleuthera ☿ (Greenway).

Nylanderia steinheili Forel—Cat. I. ☿ ♀ (Fairchild).

SOME NEW LONGICORN BEETLES FROM BRITISH HONDURAS

By E. Gorton Linsley
Oakland, California

The new species described below were noted among some miscellaneous Cerambycidæ from British Honduras, very kindly sent to me for study by Mr. Lionel Lacey of New Rochelle, New York.

Protaneflus Linsley, new genus

Elongate, parallel, subcylindrical. Head concave between the antennæ; maxillary palpi longer than labial, last segment slightly triangular; eyes very convex, coarsely granulated; antennæ longer than the body (♂), twelve-segmented; scape stout, subcylindrical, segments six to twelve flattened, serrate, carinate, segments three to seven spinose at apex. Prothorax cylindrical, slightly longer than broad. Elytra scarcely more than three times as long as broad; apices bispinose. Prosternum narrow between the coxæ; mesosternum rather broad. Anterior coxal cavities feebly angulated externally; intermediate coxal cavities closed behind. Metasternal epsterna very narrow, slightly wider at base and apex. Legs long, slender; tibiæ feebly carinate on outer side.

Genotype: *Protaneflus pubescens* n. sp.

A genus related to *Aneflus* and *Axestinus*, but differing from these in the densely pubescent body and very narrow metathoracic episterna. From the former it may be further distinguished by the twelve-segmented antennæ (♂), and from the latter by the spinose antennal segments.

Protaneflus pubescens Linsley, new species

Piceous, very densely clothed with short, white, recumbent pubescence. Head rather coarsely, closely punctured; antennæ densely clothed with short, white pubescence, sparsely ciliate at apex of segments. Prothorax transversely rugose, coarsely, densely punctured, densely pubescent. Scutellum white. Elytra coarsely and moderately closely punctured, clothed with recumbent, white pubescence intermixed with scattered, suberect hairs. Legs and ventral surface densely clothed with white pubescence. Length 31 mm; breadth 6.5 mm.

Holotype male, a unique taken at Punta Gorda, British Honduras, in June 1932, by Mr. J. J. White.

This fine species is rather suggestive of *Aneflus cylindricollis* Bates, but may be easily distinguished by the dense, white pubescence, twelve-segmented antennæ (♂), and narrow metathoracic episterna.

Stizocera laceyi Linsley, new species

Elongate, subparallel, rufo-testaceous, shining, sparsely clothed with erect pale hairs. Head with scattered coarse punctures; antennæ attaining the middle of the elytra (♀), carinate, segments three to seven spinose at apex; punctation irregular; pubescence short, sparse, intermixed with flying hairs along inner side and at apex of segments. Prothorax slightly longer than broad, coarsely but not closely punctured, clothed with scattered, erect, pale hairs. Scutellum densely pubescent. Elytra nearly four times as long as broad, yellowish-testaceous; punctation moderately coarse, not dense; pubescence pale, sparse, suberect; apex piceous, bispinose. Legs slender, clothed with long, suberect, yellowish hairs; femora bispinose at apex, the spines piceous. Ventral surface shining, sparsely, finely punctured, sparsely clothed with suberect, yellowish pubescence. Length 22 mm; breadth 5 mm.

Holotype female, captured at Punta Gorda, British Honduras, June 1932, by Mr. J. J. White.

A moderately large, shining, rufo-testaceous species with yellowish-testaceous elytra which become piceous at the apex. It is related to *S. armata* Serv. from Brazil, but in addition to differences in color, may be easily distinguished from that species by the short antennæ, which in the female attain only the middle of the elytra (in *S. armata* ♀ the antennæ are slightly longer than the body), and by the bispinose intermediate and posterior femora (in *S. armata* only the posterior femora are spinose at apex).

Stizocera aliena Linsley, new species

Elongate, slender, reddish-brown, shining. Head coarsely, closely punctured; antennæ attaining apical one-third of elytra (♂), middle of elytra (♀), carinate, ciliate, segments three to five spinose at apex. Prothorax about one-fourth longer than broad, coarsely, closely punctured, sparsely clothed with erect, pale pubescence. Scutellum densely pubescent. Elytra four times as long as broad; punctation coarse; pubescence short, erect, yellowish; apices emarginate, the outer angle dentiform. Abdomen shining, sparsely pubescent. Legs slender, sparsely clothed with erect, yellowish hairs; femora not spinose. Length 15.5 mm; breadth 2.75 mm.

Holotype female, and allotype male, taken at Punta Gorda, British Honduras, June 1932, by Mr. J. J. White.

This species differs from typical *Stizocera* as characterized by Gounelle[1] in that the femora are unarmed at the apex. In spite of this difference, *S. aliena* agrees more closely with *Stizocera* than with any other described genus. It may be associated in our lists with *S. cribricolle* Bates (from Mexico), from which the elongate, cylindrical prothorax, and slender, unarmed, non-clavate, non-pedunculate femora will easily separate it.

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[1] Bull. Soc. Ent. France, 1907, p. 241.

A SPECIMEN OF THE JAMAICAN VERMILEO

By William Morton Wheeler

In a collection of Jamaican Diptera recently received by the Museum of Comparative Zoölogy I find what might be regarded as a topotype of the Rhagionid *Vermileo tibialis* (Walker). This specimen, a male, was taken by Miss Lilly Perkins at Baron Hill, near Jacksontown, Trelawny, and is interesting both because the species has not before been recovered since it was described and figured by Walker, nearly eighty years ago, in his "Diptera Sandersiana" (p. 156, Pl. 4, Fig. 3.) as the type of his genus Pheneus, and because of its very close relationship to a Cuban Vermileo which I described in my "Demons of the Dust" (1930) and in Psyche, Vol. 36, 1931, p. 167. This form I regarded as a distinct variety (*dowi*) of *tibialis* since it differed in certain respects from Walker's description and figure, which were based on a male specimen. Miss Perkins' specimen lacks the hind legs and portions of the antennæ and anterior tarsi, but there are in other portions of the body several peculiarities which show that the Cuban form is, as I inferred, at least varietally and possibly even subspecifically distinct.

The specimen is larger and more robust than the *dowi* males which I reared from larvæ taken by Mr. R. P. Dow in August, 1930, in the Trinidad Mountains of Cuba[1]. Its body and wing measure 12 and 11.5 mm. respectively, whereas the corresponding dimensions of *dowi* are 9.5-10 and 8 mm. In the Jamaican type the face and vertex are decidedly broader, the eyes less convex, the first antennal joint shorter, not more than one and one-half times as long as broad, the humeri more prominent and more acute. The body is more uniformly fulvous, the abdominal segments

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[1] More recently, one of my students, Mr. B. B. Leavitt, collected a large number of larvae of this form at much lower elevations not far from the Atkins Laboratory of Harvard University at Soledad, near Cienfuegos, and has studied their structure, transformation and behavior.

not infuscated posteriorly and the first segment bears anterodorsally a deep black, transverse band. The halteres have yellow knobs as in the Cuban variety and the wing-venation is the same, but both the membranes and the veins are more deeply fulvous and the black, transverse band across the middle of the wing is decidedly narrower, with more irregular contour.

Since we know the precise locality in which Miss Perkins took her specimen it should now be easy to find the larvæ, which make their pits like the ant-lions in sand or dust under overhanging rocks or embankments, and to ascertain, by rearing a number of imagines of both sexes, the precise differences between the Jamaican and Cuban forms of this beautiful fly.

NOTES ON *MEGARHYSSA LUNATOR*

By Cyril E. Abbott
Morgan Park, Ill.

For several years I have had the opportunity to observe rather closely the activities of *Megarhyssa lunator,* and have discovered some curious, and apparently hitherto unknown peculiarities of behavior.

Emergence of Adult Insect

In view of the fact that the adult virgin female is found in a burrow opening just beneath the bark, as well as from the fact that this burrow must be enlarged to permit emergence, it seems likely that the larval Megarhyssa pupates near the surface of the tree. The insect is enabled to escape by biting bits of wood from the walls of her prison. In all observed cases the overlaying bark had been removed by the observer. No doubt the insect is capable of gnawing through the bark; at least a virgin female imprisoned in a cloth sack in an effort to attract males chewed her way to freedom.

The emerging female is much disturbed by suitors, which, having gathered in numbers about her burrow, insert their abdomens into the opening. In some cases a male becomes so firmly wedged into this opening, clinging meanwhile with his claws to the bark, that he is removed with difficulty by the observer.

The details concerning emergence of the males have not been observed. The openings from which they leave the tree have an average diameter of 2.27 mm., those of the females 4.30 mm.

After enlarging the opening of the burrow the female insect rests for a few seconds. She then crawls out onto the surface of the tree.

Mating

In spite of the ardor of the male insects (see Riley, 1888) there is no mad rush for union with the female. Sometimes there is a mild contest between two or three individuals; more often only one male reaches the female. He rests upon the back of her abdomen which he clasps with his legs. He then flexes his abdomen ventrally, forming thereby a flat spiral. In this position the extreme tip of his abdomen, in an inverted position, is directed toward the corresponding free or caudal end of the female abdomen. The penis, the median of the three terminal appendages of the male (the others are claspers) thus enters the genital opening of his mate in a posterior direction; a condition made necessary by the peculiar fact that the female genitalia open anteriorly.

Mating requries only a few seconds: at the end of that time the female dislodges her mate by backward thrusts of her posterior legs.

It does not seem likely that the female Megarhyssa ever again requires the attentions of a mate. Males ignore all but emerging, and hence virgin, females. Moreover, since the female possesses a definite spermatheca, it is probable that she, like other Hymenoptera, carries with her the sperm necessary for the fertilization of eggs.

Oviposition

In spite of the generally accepted conclusion that Megarhyssa deposites her eggs by *drilling* through solid wood, my own observatons contradict this claim. Of literally hundreds of ovipositing females observed, not *one* could be said to drill in the true sense of the word. In cases where this appeared to be true a judicious prying off of the overlaying bark revealed that the ovipositor had penetrated a crack in this same bark and entered the end of an open burrow. Where bark had already been stripped from the tree, individuals were often seen inserting the ovipositor directly into an open burrow.

It is of course possible that the female Megrahyssa may drill through the bark to a burrow. It is also possible that individuals may take advantage of openings made by an ovipositing Tremex. As long ago as 1794 Marsham observed this kind of behavior on the part of *Ichneumon manifestor.*

We may conclude from this that Megarhyssa is not as well equipped with wonderfully mysterious instincts for prey as some students would have us believe. In fact I once found this insect ovipositing in the burrow of a Buprestid!

Trees Attacked

Naturally Megarhyssa lives in trees most abundantly supplied with specimens of Tremex. In this region these seem to be almost exclusively soft maples (Acer saccharinum). The only other trees troubled to any extent are elms. The maples, probably because of the softness of the wood, are especially susceptible to insect attacks.

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POMPILID WASPS AND PREY-TRANSPORTATION BY WATER

By Phil Rau
Kirkwood, Mo.

One of the most interesting items of wasp behavior is reported by Needham and Lloyd[1] on the use of water as a medium for the easy transportation of spider prey by *Priocnemis flavicornis.* This Pompiled wasp was occasionally seen on Fall Creek, New York, where it combines flying and water transportation.

"Beavers swim with boughs for their dam, and water-striders run across the surface carrying their booty, but there is a wasp that flies above the surface towing a load too heavy to be carried. The freight is the body of a huge black spider several times as large as the wasp. It is captured by the wasp in a waterside hunting expedition, paralized by a sting adroitly placed, and is to be used for provisioning the nest. It could scarcely be dragged across the ground, that is with the dense vegetation of the waterside; but the placid stream is an open highway. Out into the surface the wasp drags the huge limp, black carcass of the spider, and, mounting into the air with her engines going and her wings steadily buzzing, she sails away across the water, trailing the spider, and leaving a wake that is a miniature of a passing steamer. She sails a direct and unerring course to the vicinity of her burrow in the bank, and brings her cargo ashore at some nearby landing. She hauls it upon the bank and then runs to her hole to see that all is ready. Then she drags the spider up to the bank and into her burrow, having so saved much time and energy by making use of an open waterway."

It would seem from the records that this highly intelligent behavior is an isolated case; therefore the purpose of this note is to record three similar instances of this singular behavor. It is however to be regretted that in all three cases was it impossible to get either Pompilid or spider for identification.

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[1] Life on Inland Waters, page 331, 1916.

In 1915 on the water near the shore of a lake at Lakeview, Kansas, a Pompiled and her spider were seen behaving in the same way as described above but at that time I was a novice in waspology and did not fully appreciate the drama that was being enacted before me. I thought at the time that both had fallen from the branches overhead, and the wasp was trying to regain the shore. In 1919 at Wickes, Missouri, my wife saw the same behavior on the surface of a small pond, but not having a net was unable to capture the pair; but knowing of Needham and Lloyd's account by this time she was fully prepared to appreciate the behavior.

And the third observation was made by Dr. Gustave Dahms, an ardent fisherman, who pays much attention to nature study. Here is his account as he related it to me:

On July 20th, 1932, while watching his cork bob in the stream near Creve Couer Lake, Mo., he saw a black wasp towing a spider twice as large as herself on the surface of the water. Straddling her spider, she looked like an aquaplane, while she made a distance of six feet to the wooden pillar in the water supporting a railroad trestle. Landing on this pillar, she moved upwards and backwards dragging her spider after her to the top of the trestle, and then disappeared. There was soil packed in between the railroad ties at the edges, and in this she evidently buried her spider. Most interesting of all was the fact that between 10:30 and 2:00 o'clock while this fisherman was watching his bob, this behavior was repeated four times with hardly any variation in her course, in relation to this bob. The trip, as he enthusiastically explained, was purposeful each time, and the distance of ten feet of travel in the water from the bob where he always first noticed the wasp to the post on which she clmibed consumed only about one minute, so fast did she sail. There was a slight current in her direction which helped her to make speed. Unfortunately he paid no attention from whence she came, but saw her each time as she neared the bob. Unfortunately too he did not get the specimen for identification and he never found out whether all four spiders went into one burrow or into four burrows.

A NOTE ON THE ATTACHMENT OF THE WASP, *BEMBIX NUBILIPPENNIS*, TO THEIR NESTING SITES

By Phil Rau
Kirkwood, Mo.

In "Wasp Studies Afield" in 1917 I describe the nesting behavior of *Bembix nubilipennis*. The wasps have emerged year after year in early summer, and then have dug their new tunnels in the same site where they were born, in this instance the hard-baked barren soil of a baseball diamond. This gave me at that time an opportunity to study four successive generations of these wasps in as many years.

Dr. Wm. M. Wheeler in his introduction to the above work especially calls attention to the strong attachment of these wasps to their nesting site, for they keep to the same locality for generation after generation. "Such a habit," says Dr. Wheeler, "has the ear-marks of great antiquity, and seems to indicate that the present type of nesting site is like the one in which the group originated." This statement has caused me often to visit this site over a period of years, to see how long they would maintain this colony. The colony was first observed in a vacant lot in the heart of southwest St. Louis in 1914 (*loco citato* pp. 1-36) and today, twenty years later, the colony is nesting in the same way in the same site. They have not spread to the surrounding grass plots or to a roadway nearby; the population has not diminished with the passing of the years, and neither has the population increased during this period. There is one slight variation, however, in that a portion of the population has wandered away and become colonized in a second and smaller baseball diamond two hundred feet away. This smaller diamond was made ten years ago, and I watched it yearly to note any Bembix migration. I felt the site was suitable for Bembix, and it would be only a matter of time before they would become established. The new barren area was not adopted until the seventh year of its existence, and now after four years it has only about twenty burrows of this wasp, whereas several hundred may be counted on the older diamond.

Thus we see that not only do Bembix stay on one site generation after generation, but many years are likely to elapse before certain mothers turn their attention to an attractive area just within a stone's throw of their old home. Dr. Wheeler's conclusion is probably correct when he says that the species shows its archaic origin by its nesting habits.

THE STING OF THE MALE WASP, *MONOBIA QUADRIDENS*

By Phil Rau
Kirkwood, Mo.

The females of solitary wasps have a functional sting, while male wasps are devoid of stings, but often the latter are not devoid of the desire to sting. In picking up males of *Sceliphron cæmentarium* and *Chalybion cæruleum,* one occasionally notes attempts to pierce one's flesh with the tip of the abdomen. Stinging by the males in these two species is not possible, but it may prove useful in frightening an enemy.

In *Monobia quadridens* the female can sting one's hand and cause a slight pain, but I was indeed surprised when I picked up a male to find him also able to inflict pain by piercing the flesh with the tip of his abdomen. The pain resembles that of a sharp needle prick and is over after a few seconds, since of course no poison is injected. The attempt at stinging by the male fulfills a purpose similar to the sting by the female because it effects the release and escape of the insect; the same behavior in its natural habitat, when trapped by an enemy, would prove beneficial to the male.

PSYCHE

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